Greece

The European Commission and the OECD jointly review investment needs and financing capacities for water supply, sanitation and flood protection in each of the European Union's 28 member countries[1]. A fact sheet was developed for each country. Each fact sheet: (i) highlights the main drivers of future expenditure and quantifies projected investment needs; and (ii) analyses past sources of financing as well as capacities to finance future needs.

The analysis reflected in the fact sheets aims to support cross-country comparisons. For some indicators, trade-offs had to be made between reporting the most up-to-date and accurate data for each individual country and using data available for all countries in order to support such cross-country comparisons. The fact sheets were reviewed by country authorities and have been revised to reflect comments as much as possible. Inaccuracies on selected items may remain, which reflect discrepancies between national and international data sources.

A full methodological document will be published to explain in detail the sources, categories and methods used to produce estimates. In a nutshell:

- Current levels of expenditure (baseline) on water supply and sanitation are based on a range of data sets from Eurostat, which combine water-related public and household expenditures.
- Projections on future expenditures for water supply and sanitation are driven by the growth in urban population. Additional scenarios for water supply and sanitation were developed to factor in such drivers such as compliance with Drinking Water Directive (DWD), Urban Wastewater Treatment Directive (UWWTD) and emerging EU water directives.
- The paucity of data on current levels of flood protection expenditures did not allow for monetisation of projected future investment needs. Projections of growth rates of future expenditures for flood protection combine estimates of exposure of population, assets and GDP to risks of coastal or river floods.
- The characterisation of past sources of financing in each country is derived from baseline data on current levels of public and household expenditures, debt finance and EU transfers.
- Countries' future financing capacities are approximated by analysing room for manoeuvre in 3 areas: i) the ability to raise the price of water services (taking into account affordability concerns); ii) the ability to increase public spending; and iii) the ability to tap into private finance. Affordability analysis is based on water-related household baseline expenditures, not on average tariffs (which are highly uncertain, inaccurate and not comparable across countries).

[1] Further information and project outputs can be found on the websites of the European Commission and the OECD.

The future costs of diffuse pollution, compliance with the Water Framework Directive, adaptation to climate change, contaminants of emerging concern, urban floods from heavy rains, as well as the potential of innovation to minimise future financing needs are explored qualitatively and will be reflected separately. Costs related to water storage and bulk water supply are not considered.

Key messages

- Greece achieves high compliance rates with the DWD but the performance of services is poor, particularly with regards to distribution leakages, potentially creating health hazards and inefficiencies, now and in the future.
- Connection to large water supply systems, wastewater collection and treatment are limited in some regions.
- Accurate information on flood risks is lacking, including flood risk and flood hazard maps.
- Financing is an issue, especially with regards to user affordability and access to debt finance, and particularly for areas where EU funding is not available.

Context

The Greek economy is gradually recovering from a deep recession but high social costs persist. Greece's population has declined in recent years, and is forecast to continue to decline by 2050 (European Commission, 2016a).

The Greek islands have insufficient water supplies to meet demand, relying on the use of water tankers for maintaining water supply – at considerable cost. Greece also experiences major flood events on a regular basis. Both sets of water risks are projected to increase with climate change, which will lead to increased investment needs (Bank of Greece, 2011; Kontogianni et al., 2012).

Table 1 presents a number of key indicators characterising the country context and features relevant to future expenditures for WSS and flood protection. These indicators are further discussed in the next sections, including those that underpin the projections of future investment needs.

Table 1. Key features relevant to future expenditures for WSS and flood protection

	Indicator	Value (rank if applicable)	Data Source	Year
Economy and Demographics	GDP per capita	EUR 16 200 (19/28)	Eurostat	2016
	Projected GDP growth	1.9% (16/28)	IMF	2016-2022
	Projected urban population variation by 2050	0.91x (25/28)	UN	2017-2050
Water Supply and Sanitation	Estimated annual average expenditure per capita	EUR 131	Authors based on EUROSTAT	2011-2015
	Population not connected	6%	EC	2015
	Annual domestic sector consumption per capita	96.9 m^3	EUROSTAT	
	Leakage rate for public water supply	26%	EC	2017
	Non-revenue water	n.a.	EurEau	2017
	Compliance with UWWTD Art.3, 4 and 5 (Index)	99% (5/28)	EC	2014
Flood Protection	Estimated annual average expenditure per capita	EUR 6	EC survey	2013-15
	Pop. potentially affected in flood risk areas		EC report	2015
	Value of assets at risk (rise 2015-30):	1.3x (9/28)	WRI	2015-2030

Note: Rank 1 implies best in class among the EU member countries for which data is available for each indicator.

Main drivers and projections of future investment needs

Water supply and sanitation

Greece achieves high compliance rates with the requirements of the DWD. Over the period 2011-2013, drinking water was 99-100% compliant for the microbiological, chemical and indicator parameters[2] of the DWD (European Commission, 2016b). However, the European Commission projects that Greece will have one of the highest potential health risks due to non-safe drinking water in the EU by 2050 (European Commission, 2018). Groundwater is the dominant source of water for drinking purposes. Greece is one of only four EU countries to rely on desalination for drinking water supply, amounting to approximately 2% of total drinking water supply (EurEau, 2017).

The majority (94%) of the population is connected to public water supply (European Commission, 2018). However, leakage within the distribution system is substantial. The Infrastructure Leakage Index (ILI) for Greece's water distribution assets is estimated as 9.7-16.1; for developed countries, an ILI exceeding 3 is considered poor or unacceptable[3] (Ashley

[2] Indicator parameters are used to assess the acceptability of drinking water by the consumer (e.g. taste, appearance, odour) and potential indirect impacts to human health (e.g. the presence of organic matter which may interfere with proper treatment and disinfection. If indicator parameters exceed the parametric values, this does not necessarily mean a non-compliance of the Drinking Water Directive.

[3] An ILI of less than 2 is considered excellent or good, and from 2 to 3 is considered reasonable or fair (Seago et al., 2007).

et al., 2018a; Seago et al., 2007). As a result, Greek households use the most drinking water in the EU, consuming approximately 170m^3/household/year (EurEau, 2017).

Freshwater shortage and sea level rise are the priority risks of climate change for the country. Major drought episodes are projected to become more frequent and severe, with particularly intense summer droughts (OECD, 2013). The projected cumulative cost of drinking water supply for the period 2041-2050 is estimated between 0.9-1.3% of GDP (Bank of Greece, 2011).

Greece demonstrates generally good compliance rates with the UWWTD. In 2014, all agglomerations larger than 2000 inhabitants complied with the requirements of sewerage collection (Article 3), with 89.6% of the generated load connected to collecting systems and 10.4% was collected through individual or appropriate systems (Office International de l'Eau (2017). However, challenges remain. A significant part (16%) of urban areas with over 10,000 inhabitants is served by individual systems, whose appropriateness to protect the environment may be questionable (European Commission, 2016c). Most (96%) wastewater is treated at the secondary level. However, some areas have been slow to comply, resulting in advanced legal action and fines from the European Court of Justice (European Commission, 2017).

Table 2 projects future investment needs in water supply and sanitation for a business as usual and a compliance scenario. The compliance scenario consists of two dimensions (1) investments needed to comply with the revised DWD, extend access to vulnerable populations and improve network efficiency (reduce leakage); and (2) investments needed to comply with the UWWTD. Asset renewal rates for drinking water and wastewater infrastructure are 1.5% and 1.8%/year, respectively (EurEau, 2017). This may translate to further decay of existing assets in the future.

Table 2. Water supply and sanitation: Projected investment needs to 2050 (million EUR)

GREECE		Baseline 2015	2020	2030	*Total by 2030*	2040	2050
BAU water supply and sanitation	**CAPEX**	**335**	**418**	**549**	-	**670**	**780**
	TOTEX	**1445**	**1427**	**1388**		**1346**	**1301**
Scenario Compliance + for water supply and sanitation	**ADD. CAPEX**	-	**140**	**178**	***1675***	-	-
	ADD. TOTEX		**470**	**456**	***5048***		
Compliance with DWD, access and efficiency (water supply)	ADD. CAPEX	-	15	15	*149*	-	-
	ADD. TOTEX		44	44	*437*		
Compliance with UWWTD (sanitation)	ADD. CAPEX		125	163	1526		
	ADD. TOTEX		427	412	4611		

Note: BAU projections on future expenditures for water supply and sanitation are estimated based on the growth in urban population. Additional scenarios for water supply and sanitation are based on drivers relating to compliance the DWD and UWWTD as well as (for water supply) the cost of connecting vulnerable groups and of reduced leakage. The projections do not take into account the age and pace of renewal of water supply and sanitation assets due to the lack of comprehensive and comparable data across EU member countries.
Source: OECD analysis based on Eurostat (water-related public and household expenditure data) for the baseline; United Nations and Eurostat (total and urban population statistics and projections); European Commission (estimates of costs of compliance with revised DWD and of connecting vulnerable groups, leakage rates, and distance to compliance with UWWTD).

Flood risk management

Greece experiences major flood events on a regular basis. Over the period 2002-2013, Greece experienced 22 flood events. The average cost per flood event was estimated at EUR 200 million, however data is not available for most (17) of the flood events (RPA, 2014). Greece's flood risk will be exacerbated by greater rainfall intensity and sea level rise associated with climate change.

Greece has the most extensive coastline (13 780 km) among all Mediterranean countries. Approximately 85% of the population resides, and 69% of GDP is generated, within 50 km of the coastline (Bank of Greece, 2011; ACTeon, 2018). Overall, sea level rise under the IPCC's A2 scenario is likely to flood 3.5% of the country's land by 2085 (Bosello et al., 2012). It is estimated that the phenomenon could cost the country about 2% of its GDP (in 2010 prices) (Kontogianni et al., 2012). The Bank of Greece (2011) estimates that a sea level rise of 1.0 m by 2100 will cost the Greek economy approximately EUR 650 billion, excluding non-use values. The vast majority of this cost (97%) is associated with coastal land loss for housing and tourism purposes. The Cyclades islands (comprising about 220 islands) are particularly vulnerable: a sea level rise of 0.6 m in the Cyclades is estimated to cost approximately 2.22% of national GDP (Klaoudatos et al, 2015).

The absence of flood risk and flood hazard maps in Greece is the subject of an infringement procedure initiated in 2015 (European Commission, 2017). No coordinated actions are undertaken in the field of coastal protection in Greece. Measures are decided upon in an ad-hoc way by different national authorities - the Ministry of Environment, Physical Planning and Public Works, the Ministry of Mercantile Marine and the Ministry of Economy and Finance - and implemented by local municipalities. The European Commission notes that nature-based solutions could be more systematically explored, to protect against flood risks cost-effectively.

Table 3 highlights growth factors in future investment needs for protection against (riverine and coastal) flood risks. The increase in the value of assets at risk from river flood events is lower than in other countries, although this remains an important source of future risk.

Table 3. Protection against coastal and river flood risks: Projected growth rates of investment needs to 2030

	Expenditures to protect against river flood risk			Expenditures to protect against coastal flood risk
	Total growth factors, by 2030			Categories (1-4), by 2030
	Expected urban damage	Expected affected population	Expected affected GDP	
Greece	1,61	0,68	0,85	1

Note: It was not possible to establish a robust baseline of current expenditures for flood protection due to the absence of comprehensive and comparable data across EU member countries. As a result, this table presents projected growth factors in future expenditures. A growth factor is defined as the factor by which current flood risk expenditures should be multiplied in order to maintain current flood risk protection standards in the future (by 2030). For coastal flood, countries were classified in one of four categories of projected coastal flood risk investment needs, in which 1 indicates very low growth of projected investment needs and 4 very high growth of projected investment needs by 2030.

Source: OECD analysis based on the Aqueduct Global Flood Analyzer of the World Resources Institute (river flood impacts by urban damage, affected GDP, and affected population), the global database of FLOod PROtection Standards (Scussolini et al., 2016) (for countries river flood-related protection level), the European Commission Joint Research Centre (change of build-up in areas vulnerable for coastal flooding), a 2010 study by Hinkel et al, (number of people exposed to coastal flooding, and damage costs in the case of a coastal flood event).

Other pressures affecting water quality compliance with the WFD

The majority of surface water bodies in Greece do not meet the water quality objectives of the Water Framework Directive. Good ecological status is achieved in 49% of natural surface water bodies and 6% of heavily modified or artificial water bodies (European Commission, 2017).

The main pressure on the Greek surface waters is diffuse pollution, which affects 63% of water bodies. Point sources of pollution affect 44% of water bodies and abstraction 6% (European Commission, 2017).

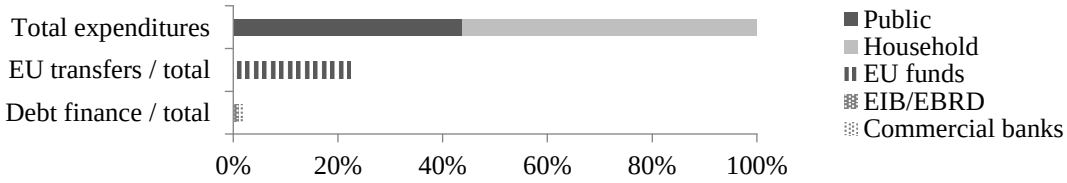
Groundwater quality is relatively high. Good chemical status is achieved in 85% of groundwater bodies. Good quantitative status is achieved in 83% of groundwater bodies (European Commission, 2017).

Past financing strategies and room for manoeuvre to finance future needs

Water supply and sanitation

Greece relies almost equally on household and public expenditures to finance water-related expenditures. Over 20% of expenditures have been supported by EU transfers, which is significantly above the average across EU member states. The WSS sector has accessed debt finance in only a very small proportion (Figure 1). Total investment in water services was EUR 424 million in 2017 (EUR 39.3/capita), an increase of 23% from 2008 investment spending (Ashley et al. 2018a).

Figure 1. Share of annual average expenditure on WSS, by source (2011-15 average, %)



Source: Eurostat (for public and household expenditures), European Commission (for EU transfers), European Investment Bank, IJ Global, Thomson Reuters, Dealogic (for debt finance).

Table 4 illustrates that Greece faces a number of challenges to finance future investment needs for WSS and flood protection, particularly for areas where EU funding is not available (European Commission, 2017). Most notably, water supply and sanitation tariffs are insufficient to meet investment needs, and the ability of authorities to increase public funding is constrained. With a significant share of the population at risk of poverty, increased financial contributions from households (whether through water pricing or taxation) could raise significant affordability concerns. For instance, expenditure to achieve compliance under Article 17 of the UWWTD is forecast to be EUR 300 per urban inhabitant (Ashley et al. 2018a).

Despite a traditionally robust domestic banking system, new credit creation in Greece remains weak due to the high burden of non-performing loans on banks' balance sheets and reduced demand for loans (OECD, 2016a).

Table 4. Indicators of future financing capacities for water supply and sanitation services

	Indicator	Value (rank)	Year	Data Source	Assessment
Ability to price water	Water expenditures in lowest household income decile	2.1% (15/26)	2011-15	Authors based on EUROSTAT	Medium to Low
	Full cost recovery equivalent in lowest household income decile	3.73% (20/28)	2011-15	Authors based on EUROSTAT	
	At-risk-of-poverty rate	21.2% (22/28)	2016	EUROSTAT	
Ability to raise public spending	Tax revenue / GDP	42.1% (21/28)	2016	EUROSTAT	Low
	Government consolidated debt / GDP	180.8% (28/28)	2016	EUROSTAT	
	Sovereign rating	B-	2017	Standard & Poor's	
Ability to use private finance	Domestic credit to private sector / GDP	113% (15/28)	2015	World Bank	Medium to Low

Flood risk management

Funding for Greek coastal protection projects is mainly provided by European programmes. Municipalities carry out coastal protection projects to the extent they receive sufficient financial means by the state or the EU (European Commission, 2009). Market penetration for flood insurance coverage is very low, compared with other OECD countries (OECD, 2016b).

Over the last decade Greece, has claimed damages to the EU Solidarity Fund for one major and three regional floods, which caused damages of over EUR 3 billion. The total EU aid granted for flood recovery amounts to EUR 112.7 million (European Commission, 2017).

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